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PARATYPHOID FEVER; REPORT OF FOUR CASES; ANALYSIS OF ALL REPORTED CASES.

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During the fall of 1901 four cases of paratyphoid fever occurred in the medical wards of the Johns Hopkins Hospital, in Baltimore. In two of these cases a paratyphoid bacillus was isolated in pure culture from the blood, and in two the diagnosis was made upon the ability of the patients' sera to agglutinate Gwyn's "paracolon" bacillus and the organisms isolated from the other two cases. In all four cases the Widal reaction was negative. Gwyn's case, including the temperature chart, which has not been published, is again reported.

Dr. Gwyn's Case.—Louis S., white, male, aged twenty-eight years, carpenter; Baltimore. Admitted October 11, 1897, complaining of fever.

Family History. Unimportant.

Previous History. Unimportant; has been living in Baltimore for the past six years. No similar illness in the neighborhood.

Present Illness. Began September 17th, with sensation of cold, pain in the abdomen, fever and thirst. No epistaxis, bowels constipated the first week. Past two weeks had diarrhœa and continued pain in the abdomen. October 10th, had greenish, watery stool every fifteen to twenty minutes.

Examination. Pale, ill-looking man; eyes sunken, somewhat excited, and talkative. Tongue moist and coated, respiration labored. Breath sounds clear, tubular modification. Heart not enlarged. Sounds clear. Pulse rapid, low tension, dicrotic. Abdomen flat and natural looking. Recti muscles slightly tense. Respiratory movements principally in the epigastric region. General abdominal tenderness. Spleen not palpable. No rose-spots. Urine dark colored. Moderate amount of albumin. Abundant granular and hyaline casts. Diazo reaction. No leucocytosis.

October 12*th*. Few dark macular spots on the abdomen; no definite rose-spots. Few moist râles over the right back and axilla. Dark-green fluid stools; 2 c.c. to 3 c.c. of blood from vein in arm, divided among tubes and plates of agar-agar.

14*th*. Delirious most of the night. Spleen just palpable. Few rose-spots over the upper thorax. Thirty-five colonies developed on tubes and plates.

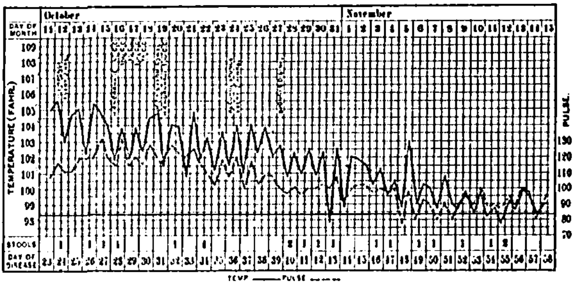
16*th* to 19*th*. Delirious at night. Six hemorrhages from the bowels, in all 500 c.c.

21*st* to 22*d*. Small subcutaneous hemorrhages on the upper right arm and over the left elbow.

November 1*st*. Stools still soft; no diarrhœa.

10*th*. Improving rapidly; left the hospital.

CHART 1.



CASE I.—Badach; Pole, male, aged twenty-eight years; laborer; Baltimore. Admitted September 11, 1901, complaining of headache, pain in the abdomen, and loss of appetite.

Family History. Unimportant.

Previous History. Unimportant. During August, 1901, worked at Curtis Bay, a low, poorly drained suburb of Baltimore.

Present Illness. Began in middle of August, with headache, epistaxis, nausea, abdominal pain, and general weakness. Stopped working during August. Worked during the first week of September; had diarrhœa on day before admission.

Examination. Well-nourished man, face flushed, and expression apathetic; tongue heavily coated, breath foul. Lungs clear on percussion, few fine râles in the right lower back. Heart not enlarged, sounds clear. Pulse slow, full, not dicrotic. Abdomen flat. Respiratory movements present. Spleen not palpable; numerous rose-spots. Urine deep orange color. No albumin, no casts; marked diazo reaction.

September 12*th*. Twelve c.c. of blood from vein in the arm divided among five Erlenmeyer flasks, each containing 150 c.c. of bouillon.

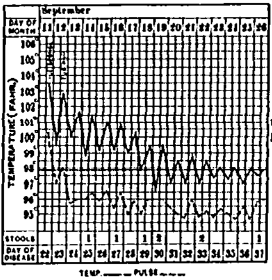
14th. Actively motile bacilli in one flask.

18th. General condition good. Tongue still heavily coated. Pulse dicrotic. Spleen not felt. Bowels constipated.

26th. No fever for three days. Tongue still coated.

October 4th. Patient up and about. Convalescence steady and uninterrupted.

CHART 2.



The organism isolated from the patient's blood failed to produce gas in the glucose agar then in the laboratory (possibly ordinary agar was used by mistake), and in spite of its slight agglutination with known typhoid sera, it was considered to be B. typhosus. Later, when its rapid agglutination with the serum of Case II. disclosed its identity, the patient had left the hospital and none of his serum could be obtained.

CASE II.—Milefsky, Russian, male, aged twenty-three years, laborer, Baltimore. Admitted September 23, 1901, complaining of headache, chills, and fever.

Family History. Unimportant.

Previous History. Unimportant. During August, 1901, worked at Curtis Bay.

Present Illness. Began September 17th, with headache, sensation of heat and cold, and loss of appetite. No nausea. September 19th, epistaxis. Slight diarrhœa, followed by constipation.

Examination. Thin, ill-looking man, face flushed and expression apathetic; tongue heavily coated. Lungs clear on auscultation and percussion. Heart not enlarged, sounds clear. Pulse slow, good volume, not dicrotic. Abdomen natural, respiratory movements present. Spleen not palpable. Few suspicious looking spots on abdomen. Urine dark yellow. No albumin, no casts. Diazo reaction.

September 25th. Twelve c.c. of blood from a vein of the arm divided among five Erlenmeyer flasks, each containing 150 c.c. of bouillon.

26th. Edge of spleen palpable and visible. Well-marked crop of rose-spots. Bowels constipated.

27th. Actively motile bacilli in one flask.

October 5th. Condition excellent. Spleen not felt. Fading rose-spots.

8th. Patient rapidly convalescing.

CASE III.—Franklin, colored, female, aged twenty-three years, housewife, Baltimore. Admitted November 6, 1901, complaining of headache, pain in the back and in the abdomen.

Family History. Unimportant.

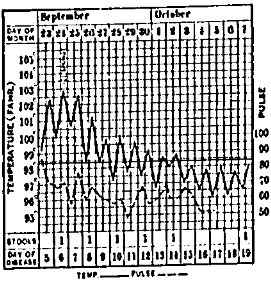
Previous History. Unimportant; has been living in Baltimore.

Present Illness. Began October 29th, with headache, severe pain in the abdomen, and general weakness. No nausea, no epistaxis. Slight diarrhœa. Since the afternoon of November 5th has been unable to void urine.

Examination. Patient dull and apathetic looking, speaks in a hoarse whisper. Tongue furred, breath foul. Lungs clear on auscultation and percussion. Heart not enlarged, sounds clear. Pulse rapid, small, easily compressed, not dicrotic. Abdomen slightly full and tender below umbilicus. Visible peristalsis. Spleen not palpable. No rose-spots visible.

Urine amber colored, a trace of albumin, no casts, marked diazo reaction. Leucocytes, 8000.

CHART 3.



November 8th. Six c.c. of blood from a vein of the arm divided among three Erlenmeyer flasks, each containing 150 c.c. of bouillon. Patient greatly excited during operation, suggesting slight delirium. Blood cultures negative.

11th. General condition good. Tongue slightly furred. Pulse small and rapid, not dicrotic. Leucocytes, 5300. Spleen not palpable. No visible rose-spots.

19th. Spleen just palpable. Leucocytes, 7300.

29th. Temperature still slightly elevated. General condition good. Tongue clear. Abdomen natural, no tenderness. Spleen not palpable.

December 12th. Sitting up, convalescence progressing uninterruptedly.

CASE IV.—Ellison, white, male, aged twenty years ("tramp"). Admitted November 29, 1901, complaining of a bad cold and fever.

Family History. Unimportant.

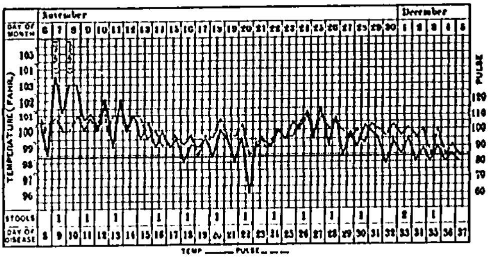
Previous History. Unimportant. For past four weeks has been tramping from Cleveland, Ohio, to Baltimore.

Present Illness. Began soon after setting out from Cleveland, with diarrhœa, five to six watery stools a day. No headache, nausea, epistaxis, or fever. Past two weeks had headache.

November 22d. Some fever, chilly sensation, and cough. General feeling of weakness and loss of appetite. Continuation of diarrhœa. No abdominal pain.

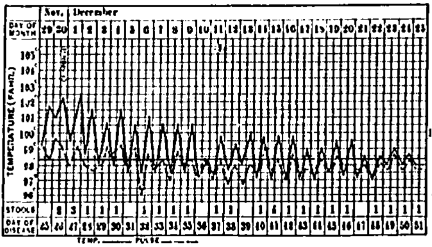
Examination. Well-nourished man. Face flushed. Expression dull. Tongue dry and coated. Lungs clear on auscultation and percussion. Area of cardiac flatness diminished. Soft systolic murmur at the apex. Pulse slightly accelerated, good volume, dicrotic. Abdomen natural. Respiratory movements present. No tenderness. Spleen readily palpable. Numerous rose-spots on abdomen and in flanks. Urine amber colored. No albumin, no casts, marked diazo reaction. Leucocytes, 5500.

CHART 4.



December 3d. General condition good. Spleen still palpable. No fresh rose spots.

CHART 5.



17th. No rose-spots, spleen just palpable. Leucocytes, 8000.

5th. Patient sitting up in a wheeled chair. Spleen not palpable. Convalescence progressing uninterruptedly.

As this case was at first regarded as the end of a mild attack of typhoid fever, with, perhaps, a delayed Widal reaction, no blood cultures were made. Cultures from the urine were negative.

Bacteriology ("Milefsky" and "Badach").

1. Morphology, motility, and staining (no attempt made to stain flagella).
   Like B. typhosus.
2. Agar plates and slants.
   Like B. typhosus.
3. Gelatin stab.
   Like B. typhosus.
4. Potato.
   Like B. typhosus.
5. Bouillon flasks and tubes.
   Like B. typhosus; no surface pellicle.
6. Durham's medium.
   (*a*) "Milefsky;" trace of indol after seven days' incubation. Observed on one occasion only.
   (*b*) "Badach;" no indol.
7. Litmus milk.
   Like B. typhosus. The first generation of "Milefsky" produced a terminal alkalinity after three weeks' growth outside the thermostat. Not again observed.
8. Glucose agar.
   Like B. coli; large amount of gas after eight hours' incubation.
9. Fermentation tests.
   (*a*) 1 per cent. glucose bouillon; profuse gas production.
   (*b*) 1 per cent. lactose bouillon; no gas production.
   (*c*) 1 per cent. saccharose bouillon; no gas production.

Parallel cultures of Gwyn's "paracolon" bacillus proved the three to be identical. Cushing's Bacillus O" differed only in the early alkalinization of the milk, a reaction once observed after seventy-two hours' incubation. When grown in 1900 by Cushing, Gwyn's bacillus produced a terminal alkalinity in from twelve to fourteen days. This reaction was not again noted. Cultures of all the other paratyphoid organisms that could be obtained were made, with special reference to their reaction in litmus milk, and it was found that in this regard they could roughly be divided into two groups.[1]

Group "*A*." No terminal alkalinity or a long-delayed reaction.

"Gwyn."
"Milefsky."
"Badach."
"Case VII." (Buxton, New York).

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[1] Practically the same grouping is made by Brion and Kayser. The final clotting of the milk described by Kurth did not again take place.

"Noonan" (Hewlett, New York).
"Müller" (Schottmüller, Hamburg).
"Barg" (Schottmüller, Hamburg). Not cultivated by us.
"Brion and Kayser" (Strassburg). Not cultivated by us.
Group "B." Terminal alkalinity in one to two weeks.
"Bacillus O" (Cushing).
"Strong" (Philippine Islands).
"Kurth" (Bremen).
"Seeman" (Schottmüller, Hamburg).
"Krenzin" (Schottmüller, Hamburg). Not cultivated by us.
"Thot" (Schottmüller, Hamburg). Not cultivated by us.
"Köcher" (Schottmüller, Hamburg). Not cultivated by us.

Agglutination Tests.

In all tests the hanging-drop method was used. No reaction that at the end of one hour did not show large clumps and absolute cessation of motility was considered "positive." When the New York and European organisms were received, the Baltimore sera, which had been kept in sealed tubes, were two to four months old and had lost about one-half their agglutinative strength. A second series of tests was, therefore, made, and several new organisms which had meanwhile been obtained were introduced. Bacillus "O" and B. enteritidis were tested with the fresh sera, as were also several strains of B. coli; but as the results of both series were the same, they are, for the sake of simplicity, included with the weakened sera tests.

In addition to the failure of our sera to agglutinate B. typhosus, etc., tests with the organisms of Group "B" were also negative. This agrees almost exactly with the results of Schottmüller's agglutination tests. In his table the organisms "Muller" and "Barg," which belong to Group "A," were either not affected or very slightly affected by the sera of the five cases belonging to Group "B," while all the organisms of Group "B" showed a marked interagglutination with the sera of this latter group. On the other hand, however, the sera of the patients Müller and Seeman, Groups "A" and "B," respectively, agglutinated the organisms of both groups; Müller's serum in the same dilution for all, Seeman's serum in higher dilutions for the organisms of Group "B." This would seem to indicate that the separation of the organisms into two groups, which is admittedly based upon insufficient data, is in reality of little significance. It is made merely in the hope of rendering the agglutination tables more intelligible.

TABLE I.

Serum.	Organism.	Race and source of organism.		Dil.	Time.	Result.
	Paratyphoid bacilli.					
Milefsky, Case II.	(Group A),					
	Milefsky,	Isolated from blood during life.	Case II., Johns Hopkins Hospital	1 : 50	1 hr.	+
Franklin, Case III.	Badach,		Case I., Johns Hopkins Hospital.	1 : 50	1 hr.	+
	Gwyn.		Gwyn, Johns Hopkins Hospital.	1 : 50	1 hr.	+
Sera, 2 to 4 months old.	Case VII.,		Buxton, New York	1 : 26	1 hr.	+
	Noonan,		Hewlett, New York.	1 : 26	1 hr.	+
	Muller,		Schottmüller, Hamburg,	1 : 26	1 hr.	+
	(Group B),					
	Seemann,		Schottmüller, Hamburg.	1 : 26	1 hr.	—
	Bacillus "O"	Osteomyelitic abscess.	Cushing, Johns Hopkins Hospital.	1 : 26	1 hr.	—
	Strong.	Spleen, post-mortem.	Lt. Strong, Philippine Islands.	1 : 26	1 hr.	—
	Kurth,	Urine or feces.	Kurth, Bremen.	1 : 26	1 hr.	—
	Typhoid bacilli.					
	Jeeny,	Blood during initial fever.	Johns Hopkins Hospital.	1 : 26	1 hr.	—
	Murray,	Blood during relapse.	Johns Hopkins Hospital.	1 : 26	1 hr.	—
	16 a,	"Blue typhoid," turns milk alkaline in six days.	Pathological Laboratory, Johns Hopkins Hosp.	1 : 26	1 hr.	—
Sera, 2 to 4 months old.	B. enteritidis (Gaertner),	....	Pathological Laboratory. Johns Hopkins Hosp.	1 : 26	1 hr.	—
	B. choleræ suis,	....	Pathological Laboratory, Johns Hopkins Hosp.	1 : 26	1 hr.	—
	Colon bacilli.					
	Lisak,	Feces.	Johns Hopkins Hospital.	1 : 26	1 hr.	—
	Caplan,	Blood during life.	Johns Hopkins Hospital.	1 : 26	1 hr.	—

Until a careful comparative study of the morphology, cultural characteristics, and serum reactions of these paratyphoid bacilli is made, no definite conclusions as to their identity can be reached. That they all differ from B. typhosus, B. coli, and B. dysenteriæ is established. That they are closely related to that large group of organisms of which B. enteritidis, B. psittacosis, B. morbificans bovis, and the bacillus of hog cholera are examples, and yet differ from this group, the work of Widal, the accurate and careful descriptions of Cushing and Durham, and these later reports indicate. The work of Cushing and Durham demonstrates not only the delicacy of the lines dividing these groups of closely allied organisms, but the extreme precautions necessary in

TABLE II.

Serum.	Organism.	Dilution.	Time.	Result.
Ellison, Case IV.	Milefsky,	1 : 400	1 hour.	+
	Badach,	1 : 400	1 hour.	+
	Gwyn,	1 : 400	1 hour.	+
Serum, two months old . .	Case VII.,	1 : 200	1 hour.	+
	Noonan,	1 : 200	1 hour.	+
	Muller,	1 : 100	1 hour.	+
	Seemann,	1 : 25	1 hour.	−
	Bacillus "O,"	1 : 25	1 hour.	−
	Strong,	1 : 25	1 hour.	−
	Kurth,	1 : 25	1 hour.	−
	Jecny,	1 : 50	1 hour.	−
	Murray,	1 : 50	1 hour.	−
	16 a,	1 : 50	1 hour.	−
Serum, two months old . .	B. enteritidis,	1 : 25	1 hour.	−
	B. chol. suis,	1 : 25	1 hour.	−
	Lisak,	1 : 25	1 hour.	−
	Caplan,	1 : 25	1 hour.	−

TABLE III.

Serum.	Organism.	Dilution.	Time.	Result.
Lane. (B. typhosus isolated from blood and from urine.) Golden. (Typhoid fever with relapse.)	Milefsky,	1 : 25	1 hour.	−
	Badach,	1 : 25	1 hour.	−
	Gwyn,	1 : 25	1 hour.	−
	Case VII.,	1 : 25	1 hour.	−
	Noonan,	1 : 25	1 hour.	−
	Bacillus "O,"	1 : 25	1 hour.	−
	Strong,	1 : 25	1 hour.	−
	Kurth,	1 : 25	1 hour.	−
	Jecny,	1 : 100	1 hour.	+
	Murray,	1 : 50	1 hour.	+
	16 a,	1 : 100	1 hour.	+
	B. enteritidis,	1 : 25	1 hour.	−
	B. chol. suis,	1 : 25	1 hour.	−
	Lisak,	1 : 25	1 hour.	−
	Caplan,	1 : 25	1 hour.	−

establishing their characteristics, and our own observations have shown that in regard to the fermentation of saccharose, a point upon which the earlier observers differed, these precautions must be doubled. For this reason, as well as for those already stated, Bensaude's conclusions as to the identity of his "paratyphoid" bacilli with B. psittacosis can be disregarded.

The extensive comparative study of the organisms described by Shiga, Flexner, and Kruse as the cause of dysentery recently made by Vedder and Duval has proved that these three strains of bacilli, at first described by their several discoverers as possessing slight cultural differences, are identical not only with each other, but with the bacilli which they themselves isolated from dysenteric stools in this country. They very naturally conclude that sporadic, epidemic, and institutional dysentery, whether occurring in Japan, Germany, the Philippine Islands, or in the United States, is always due to the presence of one organism, the B. dysenteriæ of Shiga.

With this completed study as a guide, and in spite of the fact that all the paratyphoid organisms do not as yet appear to be absolutely identical, their very intimate relationship and the sameness of the clinical picture associated with their presence justifies us in considering these cases as a distinct group.

Analysis of Cases.

The association of a thyroid abscess with an attack of typhoid fever occurring twenty-three years previously appears so highly improbable that Widal's case must, for the present at least, be regarded as an isolated observation. There are, however, 26 cases of paratyphoid fever. Buxton and Coleman's case has not yet been published, and the early histories of 2 cases, Cushing's and Strong's, are incomplete, but the remaining cases have been reported in some detail.[1]

The disease has occurred in Paris, in three cities of Germany, in three cities of the United States, and in the Philippine Islands. It has appeared in every month of the year except in the months of December, January, and February, the larger number of cases, 21 in all, occurring from July to November inclusive. There have been nineteen males and six females, their ages ranging between seven months and sixty years, about three-fourths being young adults. The duration of the disease has been from twelve to eighty-four days; from twelve to eighteen days, 4 cases; from twenty to thirty-six days, 13 cases; from thirty-six to forty-six days, 5 cases; sixty days, 1 case; eighty-four days, 1 case. 14 cases may be considered as mild, 6 as moderately severe, and 5 cases, 2 of which proved fatal, as severe.

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[1] Buxton and Coleman's case, see the June number of this JOURNAL, occurred in a young colored woman, twenty-eight years old, admitted to the Bellevue Hospital, New York City, in October, 1901. It is described as a "mild attack of typhoid fever." The points of interest are: onset with chill, fever, and sweating; frequent attacks of vomiting; two attacks of epistaxis. A tendency to diarrhœa was followed by constipation. Palpable spleen, no visible rose-spots. Duration, seven weeks.

E. H. Hume reports a similar case from the Thompson Yates Laboratories in Liverpool (see vol. iv, Part II. of Laboratory Reports for 1902): Male, aged twenty-nine years, admitted to Liverpool Royal Infirmary in September, 1901. Duration of illness fifty-three days. Relapse: palpable spleen, rose-spots, severe diarrhœa, occasionally involuntary, beginning shortly after onset and continuing into convalescence. Stools mixed with blood; considerable hemorrhage from the bowel. Cystitis in fourth week of convalescence. Widal reaction negative. A paratyphoid(?) bacillus, Bacillus "L," which was agglutinated by the patient's serum, was isolated from the stools three weeks after the disappearance of the fever, and later in pure culture from the urine. Hume regards this bacillus as a member of the B. enteritidis group. It failed to turn milk alkaline after several weeks' incubation.

Except in the mild cases and in Gwyn's case the duration of the fever is little indication of the severity of the attack.

The twenty-two available temperature charts are those of mild, moderately severe, and severe typhoid fever. In the 2 cases observed at the onset the rise in temperature was rapid, preceded in one instance by two to three days of subnormal temperature, and the histories of 2 or 3 other cases indicate a like beginning. In one of the fatal cases the febrile paroxysm began with a distinct chill. The chart of Gwyn's case alone approaches that of classical typhoid fever, though in 2 other cases the continued high temperature was accompanied by slight or active delirium. Marked remissions, even in the first weeks of the disease, irregularities unassociated with the occurrence of complications, and in three instances a termination by crisis are especially noticeable. These peculiarities do not appear to have been associated with the severity of the attack, nor with the presence or absence of diarrhœa, and have not been distinctive of the cases belonging to either Group "A" or Group "B." Single relapses have occurred in 3 cases, and one instance of a second relapse is reported. The relapses have been of shorter duration than the initial fever, beginning in one instance with epistaxis, in one with a chill, and in three instances terminating by crisis.

Except in the severe cases the pulse was slow and regular, frequently showing toward the end of the disease a marked acceleration. Dicrotism was noted in 4 of the 12 cases in which the tension of the pulse was described.

Rose-spots varying in numbers from a few scattered over the chest or abdomen to an extensive exanthem involving the hands and face were present in 18 cases. In one instance, a child of seven months, their appearance was quickly followed by a scarlatiniform rash over the back and neck, and in one instance they were present in the first and second relapses only, disappearing in the afebrile period. Small subcutaneous hemorrhages were once noted, and once a slight pigmentation followed the disappearance of the rose rash.

The spleen was palpable in 15 cases, enlarged on percussion in 3, and not enlarged in 4 (2 of which were severe cases), and in 2 cases the condition of this organ was not examined. In only 1 case was the liver enlarged.

In a large majority of the cases the onset was gradual, with headache, weakness, loss of appetite, general malaise, slight bronchitis, and occasionally chilly sensations or abdominal pain. Vomiting occurred in 2 cases; epistaxis in 4 cases. In 10 cases, or 41 per cent., the illness began with diarrhœa, which in 1 case was for four weeks the only symptom, but in only 4 of these cases did the diarrhœa continue throughout the febrile period. Five additional cases, making a total of 62 per cent., had diarrhœa during some portion of the disease. In two instances the fluid stools were mixed with blood; 9 cases, or 37 per cent., were constipated throughout. Except for the fact that 4 of the 5 Bremen cases suffered from diarrhœa, this symptom does not appear to have been characteristic of the disease in any one locality, and it has occurred in mild and severe cases alike. Of the 2 fatal cases 1 suffered with bloody diarrhœa, the other with constipation. The abdominal distention and tenderness which were frequently present bore no definite relation to the condition of the stools.

Blood counts in 10 cases showed, except during the relapse of Hewlett's case, no leucocytosis.

Albumin was found in nine of the twenty-one urine examinations, being present in both the mild and severe types of the disease. Casts were observed but four times, twice in mild cases.

The course of the disease has been complicated by a purulent monarticular arthritis appearing on the thirteenth day, a myositis of the deltoid muscle occurring on the nineteenth day, a femoral phlebitis occurring on the twenty-fourth and fortieth days of the disease, and once with intestinal hemorrhages. Achard and Bensaude's diagnosis of pyelonephritis seems hardly justifiable, and it is much more probable that the pyuria in their case was due to a cystitis in the third week of the illness. Another case of cystitis beginning in the second week of a relapse is reported. Furuncles were present in one of the severe cases, and a small area of bronchopneumonia occurred once during a relapse. The costochondral osteomyelitic abscess developing during convalescence and the case of bacilluria twenty-one days after the disappearance of the fever were the only sequelæ.

The days of disease on which the specific bacillus has been isolated from the blood do not differ from those observed in typhoid blood cultures, but on account of the differences in the methods employed in this country and abroad it is difficult to compare the numbers of paratyphoid bacilli thus isolated with the numbers found in typhoid fever. Our experience here, however, indicates that in this respect the two discases are similar.[1] The date of the appearance of paratyphoid bacilli in the urine, their estimated numbers, and their occurrence in the rose-spots also agree with the results obtained in typhoid fever. The same can be said of the estimated numbers of paratyphoid bacilli in the stools, but we can find no record of the occurrence of B. typhosus six and seven days after the disappearance of fever.

The pathological anatomy of the disease, which is described by Longcope, is not here considered.

Kurth's 5 cases occurred during an extensive epidemic of typhoid fever, as did 6 of the cases of Schottmüller. Hewlett's bacillus "Noonan" was isolated in a similar series of 26 cases. Gwyn's case was the only one of 265 cases which failed to give a Widal reaction, and Cushing's case was the only instance of paratyphoid infection recognized at the Johns Hopkins Hospital during the season 1899 to 1900. From October, 1900, to the middle of March, 1902, 194 cases of typhoid fever were admitted to the medical wards of this hospital. In 85 of these blood cultures were made with positive findings in from 70 per cent. to 80 per cent. of the cases. During this time the serum of every case in which the Widal reaction and blood culture were negative was tested with Bacillus "O" and Gwyn's paracolon bacillus. The results, excepting the 4 cases just reported, were invariably negative. The serum of 1 such case, a typical case of typhoid fever, was repeatedly tested with all the paratyphoid organisms mentioned in the tables of agglutination. The results were always negative.

Both Kurth and Schottmüller state that they were unable to trace any definite source of infection nor to establish any close relationship between the cases of their separate series, and we must for the present abide by their statement.

CONCLUSIONS. 1. There is a type of disease due to infection with the paratyphoid bacilli which in all its variations presents a clinical picture identical with that frequently produced by infection with B. typhosus.

2. Diarrhœa and a termination of the fever by crisis are apparently of more frequent occurrence than in typhoid fever.

3. Myositis and purulent arthritis, rare complications in typhoid fever, have been recorded.

4. Though the disease may be severe it is usually mild, and fatal cases are rare.

5. Absence of intestinal ulceration may prove to be a distinctive feature of the disease.

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[1] It is interesting to note that in Gwyn's case and in that described by Brion and Kayser the organism was isolated not by diluting the blood with a large quantity of melted agar or bouillon, a point of technique always necessary to success in typhoid blood cultures, but by spreading a few cubic centimetres of blood over the surface of agar tubes or plates

6. The disease, though wide-spread and occurring in localities where typhoid fever is present, is comparatively rare.
7. Every instance of negative Widal reaction is not due to infection with paratyphoid bacilli.

We are greatly indebted to Dr. B. H. Buxton, of the Cornell Medical School, for sending us his own organism and those which he obtained from Germany.

REPORT OF A CASE OF PARATYPHOID FEVER.

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UNDER the title "Infections Paratyphoïdiques," Achard and Bensaude[1] reported in 1896 two cases of continued fever, closely resembling typhoid fever, from which organisms were isolated, intermediate in character, between the typhoid and colon groups. The first case, a young woman, was admitted to the Beaujon Hospital, in Paris, with what at first appeared to be a mild attack of typhoid fever. Though the temperature remained elevated and typhoid in character for forty-six days, no rose-spots were visible, nor was the spleen greatly enlarged. She had no headache, delirium, abdominal distention, or tenderness, but throughout the febrile period there was profuse, often bloody diarrhœa. On the nineteenth day of the disease the left deltoid muscle became inflamed, and for five days the left arm was paralyzed. At this time a large amount of pus was observed in the urine. This persisted for forty-five days, or well into the period of convalescence. On the twenty-fourth day the right femoral vein became inflamed, and on the fortieth day a similar complication appeared on the left side. Throughout the disease there was no leucocytosis, and the Widal reaction was persistently negative.

From a catheterized specimen of urine they isolated an intermediate bacillus. Cultures from the blood were negative, and only B. coli was isolated from the stools. The patient's serum readily agglutinated the organism obtained from the urine, even several weeks after complete recovery. As the urine continued to show a trace of albumin some time after the disappearance of the pus the case was regarded as one of pyelonephritis.

The second case, also seen in Paris, was a child seven months old, who, in June, 1896, had an attack of bronchitis, accompanied by high fever. The few râles which were at first heard soon disappeared, but

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[1] Bull. et Mém. de la Soc. Méd. des Hôpitaux de Paris, 1896, vol. xiii. p. 820.